Listing of Claims:

1. (currently amended) A method, using a pulsed laser, of program-controlled dicing of a substrate ~~comprising at least one layer~~, the method comprising the steps of:

a. providing ~~program control means~~ a programmable laser controller and an associated ~~data storage means~~ memory for controlling [[the]] a pulsed laser that generates a laser beam propagating through a telecentric scan lens for scanning the laser beam across a substrate having at least one layer;

b. providing in the associated ~~data storage means~~ memory a laser cutting strategy file of a plurality of ~~selected~~ combinations of pulse rate, pulse energy and pulse spatial overlap of pulses produced by the pulsed laser at the substrate to restrict damage to the ~~respective~~ at least one layer while maximising machining rate for the at least one layer;

c. providing in the laser cutting strategy file data representative of ~~at least one~~ a selected plurality of scans of the ~~respective~~ at least one layer by the pulsed laser necessary to cut through the ~~respective~~ at least one layer when the pulsed laser is operating according to a ~~respective~~ selected combination of pulse rate, pulse energy, and pulse spatial overlap of pulses stored in the laser cutting strategy file, the providing of a laser cutting strategy file comprising the steps of,[[;]]

mapping a laser energy density received in a focal plane of the telecentric scan lens to produce a laser energy density map of a field of view of the telecentric scan lens using the selected combination;

storing the laser energy density map as an array in the memory; and

using the laser energy density map to modify, with the programmable laser controller, at least one of the pulse repetition rate and the pulse energy of the selected combination to produce a constant laser energy density at scanned points in the field of view at the substrate; and

d. using the pulsed laser under control of ~~the program control means~~ the programmable laser controller driven by the laser cutting strategy file to scan the at least one layer with the ~~respective at least one~~ selected plurality of scans at least to facilitate dicing of the substrate such that a resultant die has at least a predetermined die strength and a yield of operational die equals at least a predetermined minimum yield.

2. (currently amended) A method as claimed in claim 1, wherein the steps b and c of providing a laser cutting strategy file comprise, for each of the at least one layer, the steps of:

b1. varying at least one of a combination of pulse rate, pulse energy, pulse spatial overlap to provide a respective combination;

b2. measuring a cutting rate of [[the]]a respective layer using the respective combination;

b3. examining the respective layer to determine whether damage is restricted to a predetermined extent;

b4. dicing the substrate and measuring yield of the resultant die;

b5. measuring die strength of the resultant die;

b6. creating [[a]]the laser cutting strategy file of [[a]]the selected combination which maximises cutting rate while resulting in a yield of operational die which have at least the predetermined minimum yield and for which the die have at least the predetermined die strength;

c1. scanning the ~~at least one~~ respective layer using the selected combination to determine [[a]]the selected plurality of scans necessary to cut through the respective layer; and

c2. storing the selected plurality of scans in the laser cutting strategy file.

3. (original) A method as claimed in claim 2, wherein the die strength is measured using a Weibull die strength test.

4. (currently amended) A method as claimed in claim 1, wherein the step d of using the pulsed laser to scan the at least one layer includes providing a galvanometer-based scanner.

5. (cancelled)

6. (currently amended) A method as claimed in claim [[5]]1, wherein the step of mapping a laser energy density comprises using a laser power meter to measure laser energy density at representative locations within the field of view of the telecentric scan lens.

7. (currently amended) A method as claimed in claim 1, wherein the step of providing a selected combination comprises providing a selected combination which

restricts thermal loading of the material of the ~~respective~~ at least one layer to restrict mechanical stress to a predetermined maximum.

8. (currently amended) A method as claimed in claim 1, wherein the selected combination is used for less than the selected plurality of scans, which corresponds to the selected combination, to machine a layer to be cut and the layer is scanned for further scans up to the selected plurality of scans using a combination which will not significantly machine an underlying layer such that substantially no machining occurs of the underlying layer should the pulsed laser continue to scan the substrate after the layer to be cut has been cut through.

9. (currently amended) A method as claimed in claim 8, wherein the selected combination is used for scribing a substrate through the layer to be cut for subsequent mechanical dicing of the substrate.

10. (previously presented) A method as claimed in claim 1, wherein the substrate includes an active layer, wherein the step of providing a selected combination to restrict damage to the at least one layer comprises providing a selected combination which does not significantly affect the subsequent operation of active devices in the active layer.

11. (original) A method as claimed in claim 10, wherein the step of providing a selected combination which does not significantly affect the subsequent operation of active devices in the active layer comprises providing a combination which does not cause significant cracks to propagate through the active layer.

12. (currently amended) A method as claimed in claim 1, wherein the step of providing a selected combination comprises the steps of:

b7. providing an initial combination at which the laser machines the substrate at an initial rate which does not cause significant crack propagation due to thermal shock at an ambient temperature, and such that a temperature of the substrate is raised by the machining after a predetermined plurality of scans of the substrate by the pulsed laser to a raised temperature above ambient temperature;

b8. and providing a working combination at which the pulsed laser machines the substrate at a working rate, higher than the initial rate, which does not cause significant crack propagation due to thermal shock at the raised temperature;

and step d ~~of machining the substrate~~ includes:

d4. machining an initial depth of the substrate using the initial combination for at least the predetermined plurality of scans; and

d5. machining at least part of a remaining depth of the substrate using the working combination.

13. (currently amended) A method as claimed in claim 1, wherein [[an]]a pulse energy of at least a first scan of the selected plurality of scans is lower than [[an]]a pulse energy of succeeding scans of the selected plurality of scans such that a generation of surface micro-cracks is less than would otherwise be produced.

14. (currently amended) A method as claimed in claim 1, wherein [[an]]a pulse energy of at least a final of the selected plurality of scans is lower than [[an]]a pulse energy of preceding scans of the selected plurality of scans such that backside chipping of the substrate is less than would otherwise be produced.

15. (currently amended) A method as claimed in claim 1, wherein a pulse energy of the selected plurality of scans is varied between scans to facilitate removal of debris generated during dicing of the substrate~~, conveniently~~ by increasing [[laser]]the pulse energy of the selected plurality of scans with increasing machining depth to remove debris for a dice lane.

16. (currently amended) A method as claimed in claim 1, including the further steps of:

e. providing a gas handling [[means]]system to provide a gaseous environment for the substrate;

f. using the gaseous environment to control a chemical reaction with the substrate at least one of prior to and during dicing the substrate to enhance a strength of the resultant die.

17. (currently amended) A method as claimed in claim 16, wherein the step of providing the gas handling [[means]]system includes providing a gas delivery head [[means]] for delivering gas substantially uniformly to a cutting region of the substrate to facilitate substantially uniform cutting of the substrate.

18. (currently amended) A method as claimed in claims 16~~, wherein the step of providing gas handling means comprises providing means to control~~ further comprising

controlling at least one of flow rate, concentration, temperature, type of gas and a mixture of types of gases.

19. (previously presented) A method as claimed in claim 16, wherein the step of providing a gaseous environment comprises providing a passive inert gas environment for substantially preventing oxidation of walls of a die during machining.

20. (previously presented) A method as claimed in claim 16, wherein the step of providing a gaseous environment comprises providing an active gas environment.

21. (original) A method as claimed in claim 20, wherein the step of providing an active gas environment comprises etching walls of a die with the active gas to reduce surface roughness of the walls and thereby improve the die strength.

22. (previously presented) A method as claimed in claim 20, wherein the step of providing an active gas environment comprises etching walls of a die with the active gas substantially to remove a heat affected zone produced during machining, and thereby improve the die strength.

23. (previously presented) A method as claimed in claim 20, wherein the step of providing an active gas environment comprises reducing debris, produced during machining, adhering to surfaces of machined die.

24. (currently amended) A method as claimed in claim 1, comprising the further step, after the dicing, of scanning an edge of the resultant die with the pulsed laser with sufficient energy to heat sidewalls of the resultant die to reduce surface roughness thereof and thereby increase die strength of the resultant die.

25. (currently amended) A method as claimed in claim 1, ~~for producing die with rounded corners by~~ further comprising scanning the laser beam along a curved trajectory at corners of the die using a galvanometer based scanner to produce die with rounded corners, wherein the selected combination is adapted to maintain the selected pulse spatial overlap between consecutive laser pulses around an entire circumference of the die.

26. (currently amended) A method as claimed in claim 1, wherein the selected combination is adapted to deliver pulses at an arcuate portion or corner of the die such that

substantially no over-cutting or undercutting~~ generating~~ occurs, which would otherwise generate a defect at the arcuate~~ die edge~~ portion or corner [[occurs]].

27. (currently amended) A method as claimed in claim 1~~, to form a tapered dice lane having arcuate walls tapering inwards in a direction away from the laser beam by~~ further comprising varying a width of the dice lane as the pulsed laser scans through the substrate to form a tapered dice lane having arcuate walls tapering inward in a direction away from the laser beam,~~ wherein~~ the selected combination [[is]]being modified to [[give]]provide a finely controlled taper and smooth die sidewalls, [[and]] which thereby increase die strength of the resultant die.

28. (currently amended) A method as claimed in claim 1, wherein the pulsed laser is a Q-switched laser device.

29. (currently amended) A method as claimed in claim 1, wherein [[a]]the laser beam from the pulsed laser is directed by rotatable mirrors.

30. (currently amended) A method as claimed in claim 1, wherein the substrate is mounted on a tape and a pulse energy of final scans of the pulsed laser is controlled substantially to prevent damage to the tape.

31. (original) A method as claimed in claim 30, wherein the tape is substantially transparent to ultraviolet radiation.

32. (original) A method as claimed in claim 31, wherein the tape is polyolefin-based.

33. (currently amended) A program-controlled substrate dicing apparatus arranged to dice a substrate comprising at least one layer, the apparatus comprising: a pulsed laser; a ~~program control means~~ programmable laser controller and an associated~~ data storage means~~ memory for controlling the pulsed laser using a laser cutting strategy file, stored in the~~ data storage means~~ memory, of a plurality of respective ~~selected~~ combinations of pulse rate, pulse energy and pulse spatial overlap of pulses produced by the pulsed laser at the substrate and data representative of~~ at least one respective~~ a selected plurality of scans of the ~~respective~~ at least one layer by the pulsed laser necessary to cut through the~~ respective~~ at least one layer; a telecentric scan lens [[means]] for scanning a laser beam from the

pulsed laser across the substrate; and a laser power ~~measuring means~~ meter for mapping a laser energy density received in a focal plane of the telecentric scan lens to produce a laser energy density map of a field of view of the telecentric scan lens using a ~~respective~~ selected combination of pulse rate, pulse energy and pulse spatial overlap of pulses ~~for storing~~, the laser energy density map being stored as an array in the ~~data storage means~~ memory for modifying [[the]] at least ~~one respective~~ the selected combination to compensate for irregularities, introduced by the telecentric scan lens, of laser energy density at the substrate, such that in use a resultant die has at least a predetermined die strength and a yield of operational die equals at least a predetermined minimum yield.

34. (currently amended) An apparatus as claimed in claim 33, wherein the ~~program control means includes control means for varying~~ programmable laser controller is operable to vary at least one of pulse rate, pulse energy and pulse spatial overlap for controlling the pulsed laser subject to the ~~at least one respective~~ selected combination.

35. (currently amended) An apparatus as claimed in claim 33, further comprising a gas handling [[means]]system for providing a gaseous environment for the substrate for controlling a chemical reaction with the substrate at least one of prior to and during dicing the substrate to enhance strength of the resultant die.

36. (currently amended) An apparatus as claimed in claim 35, wherein the gas handling [[means]]system includes a gas delivery head [[means]] for uniformly delivering gas to a cutting region of the substrate.

37. (currently amended) An apparatus as claimed in claim 35, wherein the gas handling ~~means comprises control means for controlling~~ system is operable to control at least one of flow rate, concentration, temperature, type of gas and a mixture of types of gases.

38. (currently amended) An apparatus as claimed in claim 35, wherein the gas handling [[means]]system is arranged to provide an inert gas environment for substantially preventing oxidation of walls of a die during machining.

39. (currently amended) An apparatus as claimed in claim 35, wherein the gas handling [[means]]system is arranged to provide an active gas environment.

40. (currently amended) An apparatus as claimed in claim 39, wherein the gas handling [[means]]system is arranged to etch walls of a die with the active gas to reduce surface roughness of the walls, and thereby increase die strength.

41. (currently amended) An apparatus as claimed in claim 39, wherein the gas handling [[means]]system is arranged to etch walls of a die with the active gas substantially to remove a heat affected zone produced during machining, and thereby increase die strength.

42. (currently amended) An apparatus as claimed in claim 39, wherein the gas handling [[means]]system is arranged to etch walls of a die with the active gas to reduce debris, produced during machining, adhering to surfaces of machined die.

43. (currently amended) An apparatus as claimed in claim 33, further comprising a galvanometer-based scanner for producing die with rounded corners by scanning [[a]]the laser beam along a curved trajectory at corners of the die, wherein the selected combination is arranged to maintain the selected pulse spatial overlap between consecutive laser pulses around an entire circumference of the die.

44. (previously presented) An apparatus as claimed in claim 33, wherein the selected combination is arranged to control laser pulse delivery at an arcuate portion or corner of a die edge such that substantially no over-cutting or undercutting occurs which would generate a defect at the die edge.

45. (currently amended) An apparatus as claimed in claim 33, arranged for forming a tapered dice lane having arcuate walls tapering inwards in a direction away from the laser beam by varying a width of the dice lane as the pulsed laser scans through the substrate wherein the selected combination is modified to give a finely controlled taper with smooth die walls, and thereby increase die strength of the resultant die.

46. (currently amended) An apparatus as claimed in claim 33, wherein the pulsed laser is a Q-switched laser device.

47. (currently amended) An apparatus as claimed in claim 33, including rotatable mirrors for directing [[a]]the laser beam from the pulsed laser on the substrate.

48. (currently amended) An apparatus as claimed in claim 33, arranged for a substrate mounted on a tape, wherein the pulsed laser is controlled in final scans of the substrate so as not to damage the tape substantially.

49. (original) An apparatus as claimed in claim 48, wherein the tape is substantially transparent to ultraviolet light.

50. (original) An apparatus as claimed in claim 49, wherein the tape is polyolefin-based.